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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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Andrei Vityaev

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EXAMINER

BAKER, STEPHEN M

ART UNIT

PAPER NUMBER

2133

DATE MAILED: 07/18/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

<b>Office Action Summary</b>	<b>Application No.</b> 10/757,260	<b>Applicant(s)</b> VITYAEV, ANDREI	
	<b>Examiner</b> Stephen M. Baker	<b>Art Unit</b> 2133	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

#### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

#### Status

- 1) ☒ Responsive to communication(s) filed on 27 December 2005.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

#### Disposition of Claims

- 4) ☒ Claim(s) 1-30 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 19-25 is/are allowed.
- 6) ☒ Claim(s) 1,2,4-10 and 26-30 is/are rejected.
- 7) ☒ Claim(s) 3 and 11-18 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

#### Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

#### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

#### Attachment(s)

- |   |   |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)   | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)  | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date <u>122705, 110804</u> . | 6) <input type="checkbox"/> Other: _____  |

## DETAILED ACTION

### *Specification*

1. The disclosure is objected to because of the following informalities:

The selection process of the generator polynomial disclosed by applicant selects consecutive roots as required by the definition of Reed-Solomon codes. In the Reed-Solomon coding art it is conventional to designate the number of random (independent) symbol errors correctable by an  $(n, k)$  Reed-Solomon code as  $t$  wherein the code adds  $2t = (n - k)$  redundant symbols to  $k$  data symbols and thus has a generator polynomial with  $2t$  consecutive roots and a degree of  $2t$ . Applicant's parameters "t" and "k" do not correspond to  $t$  and  $k$  in the standard variable notation described above and thus applicant's choice of variable names is confusing.

Applicant's disclosure does not relate applicant's parameters "t" and "k" to any code generator polynomial design objective, other than doing so indirectly through the sum " $(2t + 2k) = 2t$ ". Accordingly, applicant's parameters "t" and "k" are seen as being entirely arbitrary. Furthermore, applicant's parameters "t" and "k" are described as inevitably being equal to each other (at least according to the equation for the first polynomial in paragraph 0016, where "t" is replaced by "k"), and are only used after a multiplication by two which factor also lacks any described relation to any code generator polynomial design objective. Accordingly, applicant's generator polynomial selection process appears to be an artificial and arbitrary breaking up of the conventional process of selecting  $2t$  consecutive roots into a two-part process of

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selecting two consecutive sets of  $t$  consecutive roots, described in a manner to superficially suggest that it is something else by the use of needlessly-multiple and needlessly-multiplied non-standard variable terms.

Appropriate correction is required.

### ***Claim Rejections - 35 USC § 102***

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

3. Claims 1, 2 and 4-10 are rejected under 35 U.S.C. 102(b) as being anticipated by U.S. Patent No. 5,778,009 to Fredrickson *et al* (hereafter "Fredrickson").

Regarding claims 1, 2, 4, 6 and 10, Fredrickson shows (column 6, line 55) an equation for a Reed-Solomon code generator polynomial expressed as:  $g(x) = (x + \alpha^0)(x + \alpha^1)(x + \alpha^2)(x + \alpha^3)(x + \alpha^4) \cdots (x + \alpha^5)(x + \alpha^6)(x + \alpha^7)$ , which can be viewed as the product of two polynomial factors, the first factor containing the first five consecutive roots and the second factor containing the last three consecutive roots. Alternatively, the same

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generator polynomial could be viewed as the product of two equally-degreed factors of degree = 4.

Regarding claim 5, the codewords of Fredrickson's Reed-Solomon code are written to a disk drive, one codeword per sector.

Regarding claim 7, generating a Reed-Solomon codeword requires dividing an information polynomial ("third polynomial") by the generator polynomial ("said product") and using the remainder as the code's redundancy symbols.

Regarding claims 8 and 9, Fredrickson's code generator polynomial has symbols in  $GF(2^{10})$  meaning the symbols are 10-bit symbols, the maximum code length is  $(2^{10}-1) = 1023$  symbols, so a single codeword can fill an entire sector.

4. Claims 1, 2, 4, 5, 7 and 10 are rejected under 35 U.S.C. 102(b) as being anticipated by U.S. Patent No. 5,872,799 to Lee *et al* (hereafter "Lee").

Regarding claims 1, 2, 4 and 10, Lee shows (column 8, lines 40-41) an equation for factors of a code generator polynomial expressed as:  $G_1(x) = (x^3 + \alpha^0)(x^3 + \alpha^1)(x^3 + \alpha^2)$  and  $G_2(X) = (x + \alpha)$ , the first factor containing three consecutive roots and the second factor containing one (consecutive) root.

Regarding claim 5, the codewords of Lee's code are written to a disk drive, one codeword per sector.

Regarding claim 7, generating a Reed-Solomon codeword requires dividing an information polynomial ("third polynomial") by the generator polynomial ("said product") and using the remainder as the code's redundancy symbols.

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5. Claims 1, 2 and 4 are rejected under 35 U.S.C. 102(b) as being anticipated by U.S. Patent No. 5,465,260 to Zook (hereafter "Zook").

Zook describes (column 4, lines 47+) a Reed-Solomon code generator polynomial with  $v$  consecutive powers as roots  $\alpha^{r-v+1}$  to  $\alpha^r$  and a CRC code generator polynomial with  $k$  consecutive powers as roots  $\alpha^{r+1}$  to  $\alpha^{r+k}$ . The combined Reed-Solomon/CRC code is the product of both code generator polynomials.

6. Claims 26-30 are rejected under 35 U.S.C. 102(b) as being anticipated by U.S. Patent No. 6,363,511 to Massoudi *et al* (hereafter "Massoudi").

Regarding claims 26-28 and 30, Massoudi discloses a decoder (Fig. 4B) for Reed-Solomon product-code codewords, including two stages of correction (410, 414). Massoudi also mentions the possibility of a software-based implementation (column 13). Massoudi's row correction stage (410) provides a "first processing stage used to correct a first maximum number of symbol errors in said encoded codeword," Massoudi's column and EDC syndrome generator stage (412) provides a "second processing stage used to detect symbol errors" and Massoudi's column correction stage (414) provides a "third processing stage used to correct a second maximum number of symbol errors in said encoded codeword."

Regarding claim 29, Massoudi's row correction uses 10 redundant symbols per row and Massoudi's column correction uses 16 redundant symbols, capable of correcting more errors (8 errors correctable per column correction vs. 5 errors correctable per row correction, using the DVD standard product code).

***Allowable Subject Matter***

7. Claims 3 and 19-25 are allowed.
8. Claims 10-18 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.


***Conclusion***

9. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.
10. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Stephen M. Baker whose telephone number is (571) 272-3814. The examiner can normally be reached on Monday-Friday (11:00 AM - 7:30 PM).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Albert DeCady can be reached on (571) 272-3819. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.



Stephen M. Baker  
Primary Examiner  
Art Unit 2133

smb